COLORED STONES

ASSIGNMENT 15

TURQUOISE

IDENTIFICATION, PRODUCTION, MARKETING, BUYING

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I. INTRODUCTION

Four bracelets made of turquoise and cast gold are the oldest pieces of wrought jewelry known in the world. For over five thousand years they remained on the arm of the mummy of Queen Zer, an Egyptian queen, and were still beautiful when they were excavated in 1900.

Turquoise has been popular since ancient times and is still considered one of the most important of the opaque gemstones. Perhaps more than any other gemstone its popularity runs in cycles. At the peak of a cycle turquoise jewelry is in vogue, then it gradually falls out of style until the next time fashion makes it popular. Even during the low points of the cycle, however, many people buy turquoise because they like its color and texture or because they are attracted to it in a particular piece of jewelry. Today, turquoise alternates with zircon as the December birthstone.

The name turquoise (pronounced TUR-kwoyz), which was first used in the thirteenth century, is thought to have come from a French word meaning Turkish stone (*pierre turquoise*) probably because the gemstone first reached Europe by way of Turkey. The Persian word for turquoise is *ferozah* or *firozah,* which means victorious. The Tibetan word for turquoise *gyu* is curiously similar to the term *yu* which the Chinese apply to jade, their most precious gem.

All of the cherished gemstones of earlier civilizations are surrounded by fascinating lore. Although most gemstones were regarded as bearers of good fortune, the wealth of beliefs about the benefits of owning turquoise is hard to match. Almost every book on gems and jewelry contains lengthy accounts of these legends and superstitions. Most ancient civilizations valued turquoise highly; the Egyptians, Persians, Aztecs, Incas, and the southwestern American Indians are those most frequently mentioned. As far as is known, turquoise is still the most popular of all materials used for personal adornment in Tibet. Historically it played an important part in the religious ceremonies of the Tibetan people, but the current government discourages such use.

For centuries the Indians of the southwestern United States used turquoise as a medium of exchange. They used it in jewelry and to adorn their house fronts and graves; to them, it embodied the spirits of the sea and the blue sky. They also believed it had the power to bring abundant spoils to their warriors, many animals to the hunter, and happiness and good fortune to all who wore it. Another widespread belief was that turquoise had the power to protect the wearer from injury if he fell, especially from horseback, and that it made the horse more sure footed. One of the oldest pieces of turquoise Indian jewelry was found in Death Canyon, Arizona; it is a pendant consisting of a hardwood ring, 8.25 cm (3 ¼ in.) across, bearing a mosaic formed of 81 pieces of turquoise affixed to the wood with gum.

Today, partly because it is mined there, turquoise is practically the unofficial gemstone of the American Southwest. The Indians from that area still prize it highly and have always used it in their jewelry. At various times Indian jewelry has enjoyed tremendous popularity, followed by periods when it practically disappears from view. Regardless of fashion in the rest of the world, however, this type of jewelry is perennially popular in the American Southwest.

II. VARIETIES AND TRADE NAMES

By definition the color of an idiochromatic gemstone is caused by an element that is an essential constituent of the material. Turquoise is an idiochromatic gemstone because one of its essential constituents, copper, causes its blue color. Unfortunately iron, which occurs as an impurity, also affects turquoise's color; it causes the all-too-common greenish cast. The following terms are used in the trade to indicate the quality of turquoise, but **they do not necessarily denote geographical origin.** Much of the American production is high quality and could be called persian grade.

A. PERSIAN

This variety is intense medium blue and is the least porous of the turquoises; therefore, it has a slightly higher specific gravity than most material and takes a better polish.

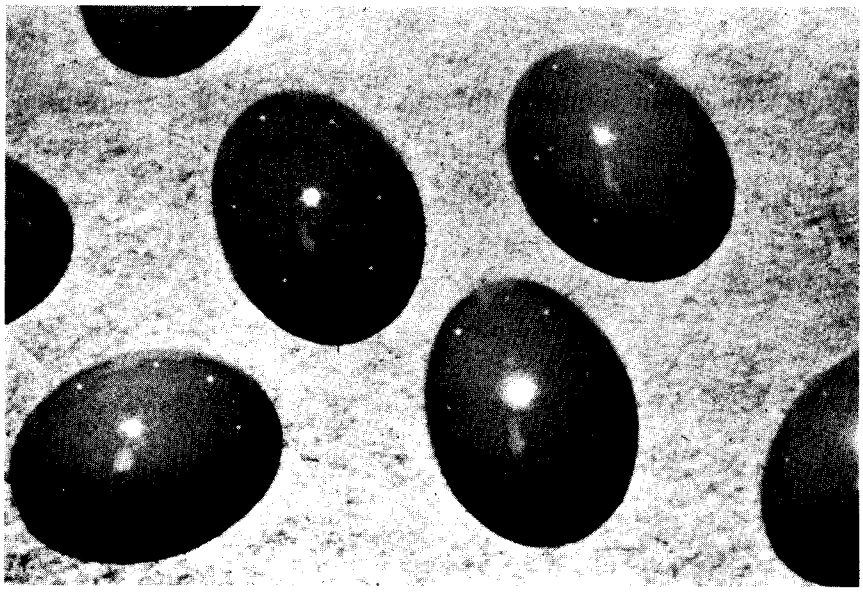


Figure 1 NOTE THE UNIFORMITY OF COLOR AND THE EXCELLENT POLISH ON THESE CABS OF PERSIAN TURQUOISE.

B. AMERICAN OR MEXICAN

This variety ranges from pale to light blue and from greenish blue to bluish green. It is often somewhat porous.

C. EGYPTIAN

This variety is greenish blue to yellowish green. Although it is usually less porous and more dense than American turquoise, the color is less attractive because the material contains more iron.

D. TURQUOISE WITH MATRIX

Specimens containing portions of the mother rock are called turquoise with matrix or sometimes just matrix turquoise. Stones with included matrix resembling a spiderweb pattern are the most important of this type.

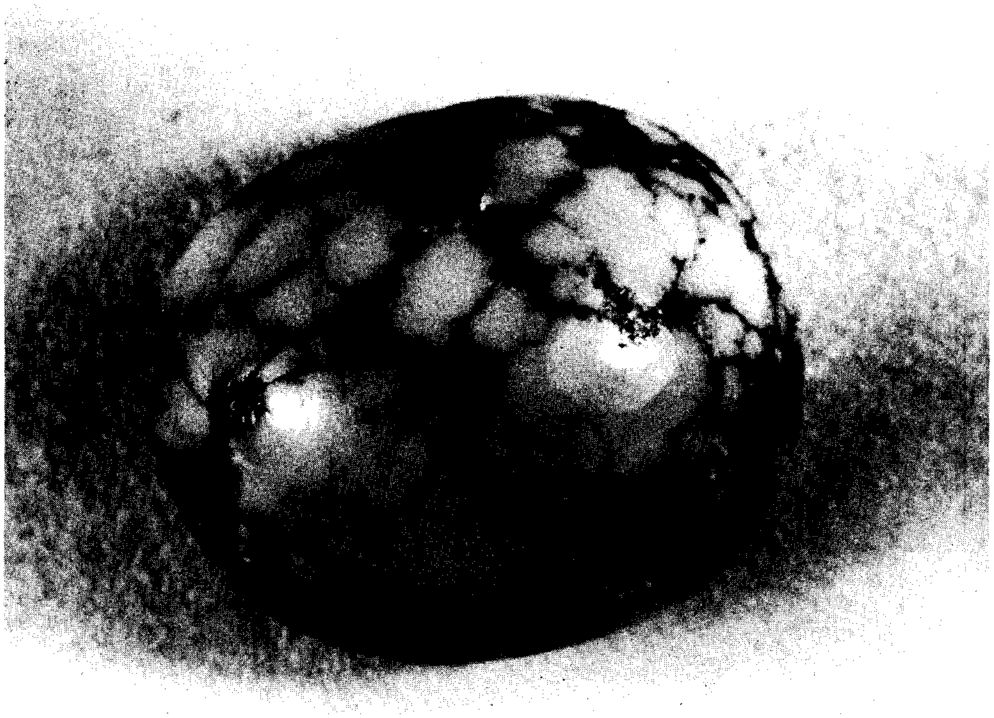


Figure 2 TURQUOISE IN MATRIX

III. MODE OF FORMATION

Turquoise is a secondary mineral. Circulating groundwaters carrying copper, aluminum, and phosphorus (leached from earlier copper bearing granitic rocks) deposit it in veins and as nodules (rounded masses) near the surface. The veins are seldom sufficiently wide to produce thick stones, often they are so narrow and irregular that the recovered mineral can only be used as turquoise matrix. Occasionally turquoise is found in alluvial deposits as nodules, but only rarely because it weathers rapidly when exposed at the surface.

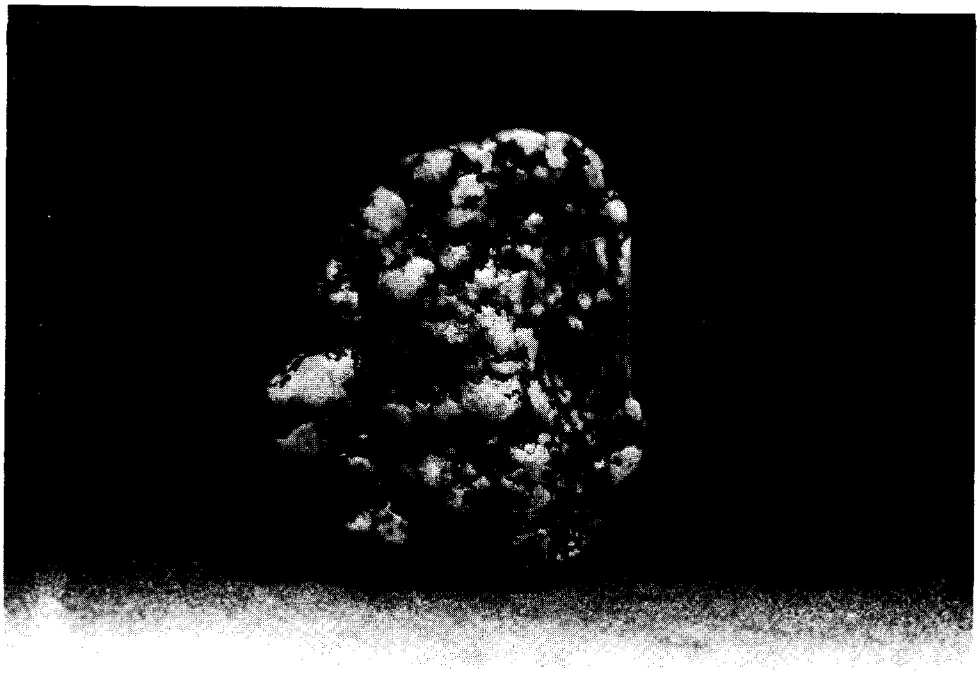
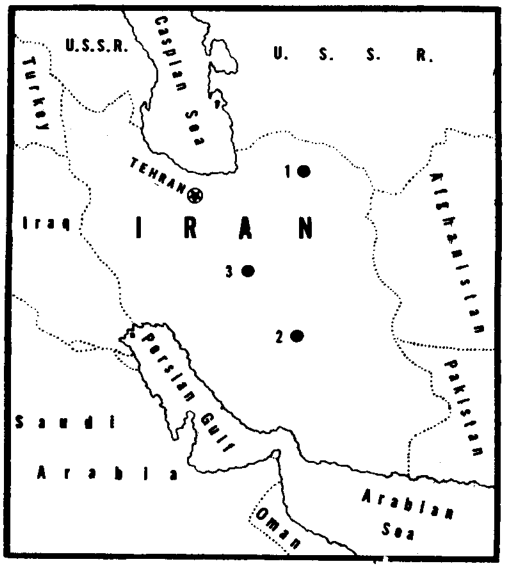


Figure 3 A NODULE OF TURQUOISE

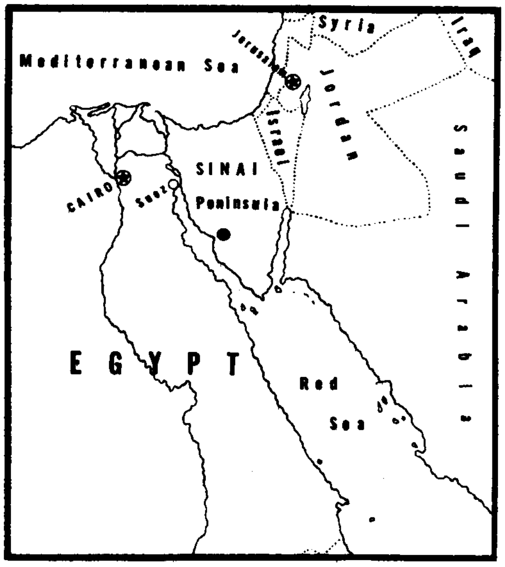
IV. SOURCES AND RECOVERY METHODS



(Note: The numbers in parentheses in this portion of the text refer to approximate locations of sources on the accompanying maps.)

The ancient mines near Nishapur are the source of what is usually considered the finest turquoise. They are located in the northeastern corner of Iran (Persia), about fifteen miles west of the town of Mashhad (1). The entire deposit lies on the southern slope of Ali-Mirsai, one of the mountains in the region. The turquoise occurs both in veins in an altered trachyte (pronounced TRACK-ite), which is an extrusive igneous rock, and in alluvial deposits. The finest stones are found in the alluvial deposits, where they occur as pebbles weathered to a chalky white on the outside but containing cores of fine quality turquoise. For hundreds of years nearly all the turquoise used in Europe and western Asia came from these ancient mines, and for many decades it supplied the American trade as well. Before World War I, turquoise mining was a leading industry in Iran, but today production is at a virtual standstill. Other Iranian deposits are situated near Kerman (2) and Yazd (3); however, these have never been important producers.

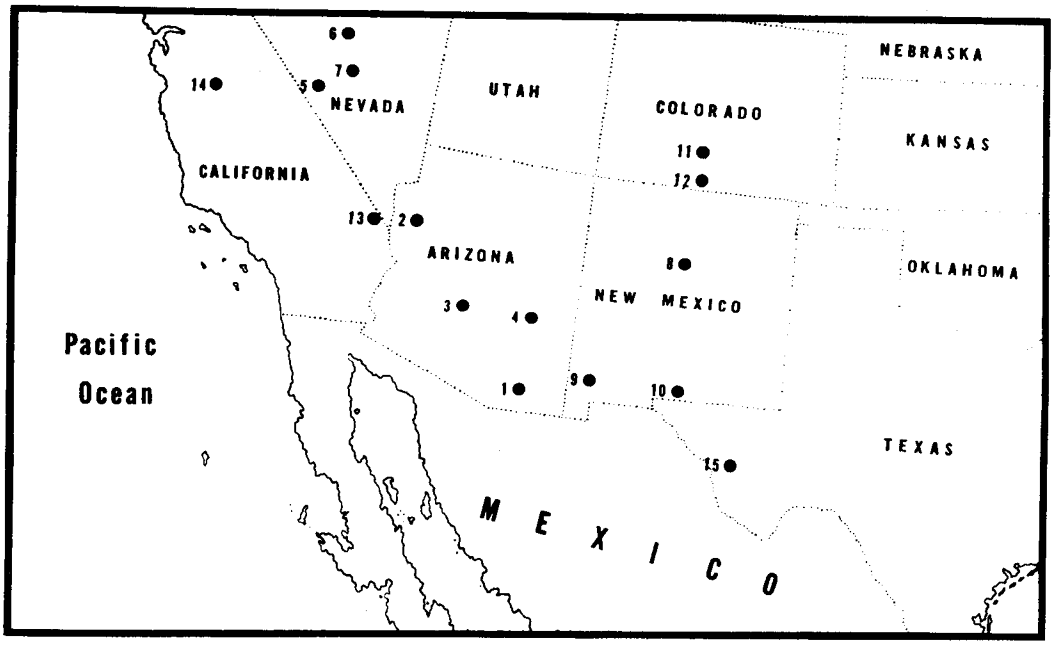
The oldest turquoise mines in the world are situated on the Sinai Peninsula, on the north side of a valley called Wadi Maghara. Here the gem is disseminated in thin seams through a red iron-bearing sandstone, as well as in a porphyritic igneous rock. Beads found in prehistoric graves prove that the Egyptians used turquoise as early as 5500 B.C. (before the first dynasty). By the time of the first dynasty (about 3200 B.C.), the kings of Egypt were sending expeditions of miners to Sinai. These royal mining expeditions were highly organized and often composed of two or three thousand laborers with a military escort. The long journeys were usually begun in November and concluded in May before the summer heat became excessive. In at least one instance, however, three years elapsed before the adventurers returned home. The mines were worked in this manner over a period of approximately two thousand years until late in the twentieth dynasty (about 1100 B.C.). The quantity of turquoise obtained was never great, although historical records show that the mines produced about 882 lb. in one year. Malachite was a by-product, and the miners usually brought back manganese and copper ores to be used in glazes and enamels.



About 1845, an Englishman rediscovered the old mines at Wadi Maghara and worked them on an extensive scale from about 1854 to 1866. Somewhat later a Frenchman worked the mines for a short period, and in 1903 English promoters obtained a concession. This last attempt was a complete failure, and they abandoned work after a year or two. Even now, the Bedouins occasionally pick up stones in this region and barter with them; but all known deposits on the Sinai Peninsula are probably exhausted, and there is little reason to believe that further discoveries will lead to a revival of systematic mining.

Other foreign sources of little or no importance are Tibet, China, Australia (Queensland, Victoria, and New South Wales), Mexico (Sonora and Zacatecas), Peru, Chile, the U.S.S.R., (Turkestan), and Afghanistan.

Today the United States is the world leader in the production of turquoise, most of which comes from the southwestern states, particularly Arizona. Occurrences in Arizona are near Tombstone, Cochise County (1); Mineral Park mine, near Kingman, Mohave County (2); Pierce, Maricopa County (3); and in the Pinto Valley mine in the Miami-Globe district, Gila County (4). The most important area lies east and south of Mineral Park. The principal deposits in Nevada are in Esmeralda County (5), the Battle Mountain area of Lander County (6), and Nye County (7). Although it is currently not a great producer of turquoise, New Mexico has produced large quantities in the past. Production has come principally from four districts: Cerrillos Hills, Santa Fe County (8); the Burro and Little Hachita Mountains, Grant County (9); and the Jarilla Hills, Otero County (10). The Cerrillos and Burro districts are perhaps the best known. Smaller deposits are located in Sagauche County (11) and Conejo County (12), Colorado; San Bernardino County (13) and Fresno County (14), California; and Culberson County, Texas (15). In 1962 extremely rare turquoise crystals were discovered at Lynch Station, Virginia. They were also found at a later date occurring in Narooma, New South Wales, Australia.



Turquoise mining is usually a very simple process that requires little shaft sinking or subsurface tunneling because turquoise is never found in quantity at depths exceeding 30 m (approx. 100 ft.). Usually it is exposed on the surface; good material is often at a depth of a few feet. An open cut trench or shallow pit is used for shallower deposits, but for extensive operations at slightly greater depths, a shaft is usually sunk and tunnels extended horizontally at intervals along the vein. Because most turquoise is found in arid regions where drainage is not a problem, and since most deposits are small and located at shallow depths, elaborate and expensive mining equipment is not necessary. Thus, most turquoise mining is somewhat primitive. After the rock has been loosened, it is broken with hammers and hoisted to the surface in buckets. Additional crushing is then done, and the material is sorted.

V. FASHIONING

Turquoise is usually cut en cabochon in either oval, round, square, rectangular, or numerous fancy shapes. It is also fashioned into beads and shapes imitating a variety of elaborate designs. The beads are sometimes faceted, but more often they are smoothly rounded. Tumbled baroque shapes are frequently seen, and of course, large pieces may be carved into snuff bottles, vases, figurines etc.

Since turquoise grinds away very rapidly, only fine grained sanders and grinding wheels should be used. The stone should be kept cool at all times. Turquoise can be polished on either a leather buff with aluminum oxide powder or on a felt wheel with cerium oxide.

VI. PHYSICAL AND OPTICAL CHARACTERISTICS

Physical

Chemical Composition	A complex hydrous copper aluminum phosphate, expressed by the formula $CuAl_6(PO_4)_4(OH)_8.5H_2O$. Iron may replace some aluminum. Copper causes the blue color; iron may cause the green color. Water content also influences the blue color.
Crystallographic Character	Triclinic system; cryptocrystalline. Minute crystals are known to occur, but they are rare.
Cleavage	None
Fracture	Conchoidal, granular, depending on porosity.
Hardness	5 to 6, for compact material, less for porous material.
Toughness	Chalky material is poor and easily fractured; fine quality is fair to good.
Streak	White or greenish.
Specific Gravity	2.40 to 2.84; normal, 2.76

Optical

Degree of Transparency	Opaque; thin sections are translucent.
Luster	Polished surfaces are waxy to vitreous; fracture surfaces are waxy to dull.
Phenomena	None
Characteristic Inclusions	Matrix in the form of limonite or other iron oxides.

Pleochroism	None
Refractive Index	1.61 to 1.65 (doubly refractive). Because turquoise is an aggregate, only one reading is visible on the refractometer usually at about 1.61.
Birefringence	Strong, but not apparent by any gemological test.
Dispersion	None
Optic Character	Since most turquoise is opaque and cryptocrystalline, its optic character cannot be proved by usual gemological tests. Crystals are biaxial positive.
Ultraviolet Fluorescence	None to weak greenish yellow under long-wave; inert under short-wave.
Color-Filter Reaction	None
Absorption Spectra	Two medium to weak bands at 4320 and 4200 A.U. are occasionally seen in strong reflected light. The 4320 A U. band is the strongest and can sometimes be seen by transmitted light on thin sections.

(Note: Although the equipment necessary for X-ray testing is not readily available to most gemologists, the results of such testing are listed for the sake of completeness.)

X-Ray Fluorescence	None
Transparency to X-Rays	Nearly transparent.

Effects Caused by:

Heat	Usually decrepitates (i.e., pieces "explode" off the main mass until nothing remains), turns brown and colors the flame green.
Acids	Dissolves slowly in hydrochloric acid.
Irradiation	No effect.

VII. SUGGESTIONS FOR TESTING

A. SEPARATION FROM OTHER MATERIALS

Turquoise's color, opacity, and luster are characteristic. It occurs only in light to medium tones of blue and sometimes darker tones of green, colors that are characteristic of very few other semitranslucent to opaque stones. Most turquoise has a chalky appearance in the rough, a subvitreous luster at best when polished, and is opaque. Fine blue specimens have a waxy luster in the rough, are vitreous on polished surfaces, and are semitranslucent. On the basis of a word description alone turquoise might be confused with many nontransparent materials, but when descriptions of body appearance and transparency are added, there are few stones that cause difficulty with the exceptions of Gilson synthetic turquoise, prosopite (pronounced PROS-o-pite), and dyed howlite (pronounced HOW-lite).

Separation of natural from synthetic turquoise is based on visual characteristics and the lack of any absorption spectra in the synthetic. The R.I. is approximately 1.60, compared to 1.61 of the natural, but the R.I. of a natural stone could be slightly lower and thus overlap. The S.G.s are too close to separate. Because the synthetic is very pure and so far has never had any iron in it, there is no absorption line in the spectrum. Natural turquoise, which almost always has some iron in it, usually shows a weak to medium strong line in the deep blue at about 4320 A.U.; the deeper the color, the stronger the line. Under magnification, the synthetic has a structure consisting of numerous closely packed tiny spheres. Natural turquoise does not have this characteristic structure. Gilson's synthetic turquoise has generally been accepted as a true synthetic since chemical composition, structure (as determined by X-ray diffraction), R.I., S.G., and other properties are essentially the same as natural

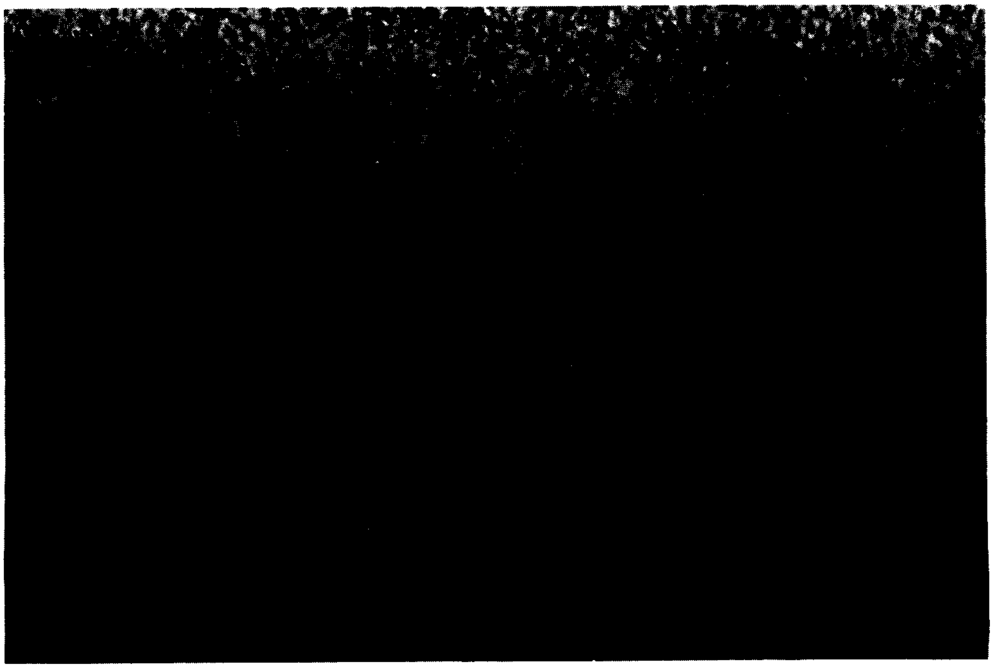


Figure 4 CHARACTERISTIC MICROSPHERES OF SYNTHETIC TURQUOISE. THEY ARE USUALLY VISIBLE AT ABOUT 50X MAGNIFICATION.

turquoise. However, some people do not think it is a true synthetic since the microspheres of turquoise are apparently held together, at least in part, by some type of binding agent.

Although prosopite may be similar in appearance to the best turquoise, it is usually well polished and can therefore be separated readily by R.I. The R.I. of prosopite is 1.50 to 1.51; S.G. is approximately 2.88.

Note: Avoid making S.G. determinations with heavy liquids because bromoform and methylene iodide may discolor highly porous turquoise. R.I. fluid may do the same.

Howlite is an opaque, white boron mineral that may be dyed to closely resemble turquoise. Dyed howlite might be confused with plastic treated turquoise on the basis of color, but plastic treated turquoise will often give a characteristic reaction to the hot point as discussed later in this section. In addition, howlite's R.I. (1.586-1.605) is slightly lower than turquoise's R.I. (1.61-1.65).

Chrysocolla stained chalcedony may be similar in appearance to turquoise, but it is usually well polished and can therefore be separated by R.I. (1.53 - 1.54). It is also more translucent and lacks the chalky appearance that often characterizes turquoise. The mineral chrysocolla itself resembles turquoise, but is readily distinguished by its low S.G. (2.24 or lower) and a hardness of 4 or less.

Odontolite may also be similar in appearance to turquoise. Odontolite is fossil bone or teeth that have been colored blue or greenish blue by impregnation with iron phosphate (See Section II of Assignment 32 for a discussion of odontolite) It not only has a higher S.G. (3.10) than turquoise, but under magnification it has the cellular structure typical of bone.

The novice may confuse greenish turquoise with any of the opaque green gem materials. However, only a few stones cause much real difficulty; these are variscite, malachite, greenish odontolite, and chrysocolla stained chalcedony. The latter two can be separated by the means discussed above. Variscite has a lower R.I. (1.56-1.59) and S.G. (2.50) than turquoise. The malachite used for gem purposes has an agate-like color banding in various shades of dark and medium green; its S.G. (3.95), R.I. (1.660-1.910), and birefringence are also much higher.

In addition to the natural stones that could be confused with turquoise, there are also a number of artificial substitutes manufactured to imitate it. Glass and plastic are the most common of these manufactured imitations. They frequently have swirls of color (blue and white streaks) on the base, and they may have rough ground bases as opposed to the polished bases of most, but not all, turquoise. There may be mold marks around the girdle or hemispherical cavities on the surface that are the result of open gas bubbles. Glass or plastic usually has a somewhat lower R.I. although occasionally it might be the same as turquoise (1.61). A distinctive feature of most glass or plastic imitations is that they have a vitreous luster on fractures, whereas chalky blue turquoise has a dull fracture luster, and finer semitranslucent stones have waxy fracture lusters. Under magnification, bubbles can sometimes be seen just below the surface of plastic or glass. Remember that matrix inclusions can be imitated very well in plastic or glass; however, this "matrix" will be flush (even) with the surface. Matrix in turquoise, since it is either harder or softer than the body of the stone, is either a protrusion or depression on the surface.

An artificial substance closely resembling blue turquoise both in appearance and properties was produced several years ago on a commercial scale. This substitute was detected when it was immersed in water for a few hours because it became a darker blue with a network of fine, lighter colored lines (almost white) on the surface; it also softened when immersed in alcohol. A plastic bonded substitute resembling the spiderweb variety of blue turquoise has also appeared on the market. It is produced by the precipitation of an artificial compound similar in composition to turquoise. When the precipitate hardens, it is broken into small pieces and bonded together with dark colored plastic under low pressure. The dark lines in this material indicate the plastic bond and provide the best means of detection, because the softness of the plastic can be determined with a sharp needle whereas the dark matrix in turquoise is harder and will resist the needle.

Be cautious of using polariscope and streak tests. Even turquoise that transmits enough light around the edges to suggest analysis in the polariscope is unlikely to give satisfactory results. Both the turquoise and the rough backed glass imitation (the most common substitute) are likely to remain light at the edges when rotated in the dark position of this instrument. Because most turquoise is soft, streak tests should be limited to the girdle edge to avoid damage to the polished surface. In general, streak tests should be avoided.

B. TESTING FOR TREATMENT

Much of the turquoise mined today is treated to improve its color and general appearance. Accurate statistics are difficult to obtain, but informed people have suggested that the majority of the turquoise from the American Southwest is treated. When it is mined, this material may often be porous and chalky light blue or green. It is then treated with waxes, oils, plastics, and sometimes dye to improve its color.

There are numerous ways to treat turquoise and new ways are being developed all the time. The general processes used today are outlined below.

Many dyes have been tried, but none have worked perfectly; most produce an unnatural color or are not permanent. Greenish stones that have been colored blue with aniline dye will turn greenish or white when tested with a drop of ammonia. Some dyes can not be detected by any method short of chemical analysis, but dyes are seldom used since oils, waxes, or paraffin alone will usually produce a more desirable color.

Usually treatments are done under low heat and pressure. The oldest form of treatment is soaking in oil, but stones have also been boiled in paraffin or other kinds of wax. Both of these methods darken the color and make the stone less chalky looking. However, turquoise that has been treated with wax or oil tends to discolor within a few months, usually changing to an undesirable green color. This color change is irreversable.

The most recent and most successful form of treatment is plastic impregnation. Although the turquoise industry is notoriously secretive about the details of this process, it does seem clear that the rough material is immersed in liquid plastic while under heat and pressure. In many instances a vacuum process is also used. The plastic penetrates only the surface of some pieces, in other instances it permeates the material. To avoid calling this material treated, dealers frequently use the term "stabilized" to describe plastic impregnated turquoise. Plastic treated turquoise holds its color better than oiled or waxed turquoise; in some cases the improvement may be permanent.

Since a jeweler's most important consideration is to avoid selling stones that might fade or discolor, it is wise to test all stones for treatment before putting them into inventory. The best test for treated turquoise is the careful and judicious use of the thermal reaction tester, a rheostat controlled, electric hot point. The stone should first be tested for oil, paraffin, or wax treatment by holding the hot point probe close to, but not touching, the surface in an inconspicuous area. This should be done under the microscope with the rheostat set so that a low to medium heat is generated at the point. Any flowing of oil or melting of paraffin or wax should be easily visible under magnification. If there is no visible flowing or melting, increase the heat slightly till the point is a dull red, but do not touch the stone yet, just hold the point very close. If there is still no reaction to the heat, the stone has not been treated with oil or wax. In order to test the stone for plastic treatment, you must now actually touch the stone with the hot point. Be sure this is done on an area that won't be visible. Look for a crack or depression in the stone where the plastic might have accumulated. Remember that both natural and synthetic turquoise can be damaged by heat, so don't hold the hot point on the stone for longer than two or three seconds. Some plastics give off a readily discernable odor when heated, others do not. If you detect the acrid odor of melting plastic, you can be sure the stone has been treated.

If there is no flowing and no odor but the stone discolored when the hot point touched it very briefly, the material may still be treated. If possible check the S.G. of the stone. Because treated material is porous, it has a lower S.G. than normal compact turquoise. If the material has too low an S.G. for the depth of color, you can assume it has been treated. If the hot point test is inconclusive and you are unable to determine S.G. because the stone is mounted, it may be wiser to refrain from making a judgment about treatment. Caution: Because porous turquoise will absorb S.G. liquids, you should always test the stone with the hot point before checking its S.G. Keep in mind that S.G. liquids may alter the color and appearance of turquoise; they may also affect the hot point test. What might look like flowing of wax or oil might actually be the evaporation of S.G. liquids. In addition, the smell of S.G. liquids will mask the smell of any plastic present.

Deciding whether or not to call turquoise treated requires considering and weighing a number of factors. The decision becomes easier with experience because a perceptive gemologist will remember subtle differences in color and appearance that will help him make a decision. However, all gemologists, whether novice or experienced occasionally face a difficult turquoise call. In some instances, your customer will be entirely satisfied with a verbal report that you are 99% sure the material is treated. In other circumstances (written appraisals for example), there is no margin for error. If you have a difficult call and want to be absolutely certain about your decision, the most sensible course of action is to send the stone to one of GIA's Gem Trade Laboratories for identification.

VIII. EVALUATION

Turquoise is divided into two groups: turquoise without matrix and turquoise with matrix. The term spiderweb turquoise indicates a smoothly colored specimen whose surface is evenly covered with matrix in a network of fine lines. If these lines are not thread-like in thickness, the stone is merely considered turquoise matrix.

A. 1st QUALITY

1. Stones of top quality are an intense medium blue. The color is smooth and evenly distributed (no spots of darker or lighter blue) and there is no trace of matrix. The high luster and semitranslucency produce a glassy appearance on the surface. This material is rare and known as Persian turquoise. The trade grade Persian, as used here, does not imply any geographical location, only the grade.

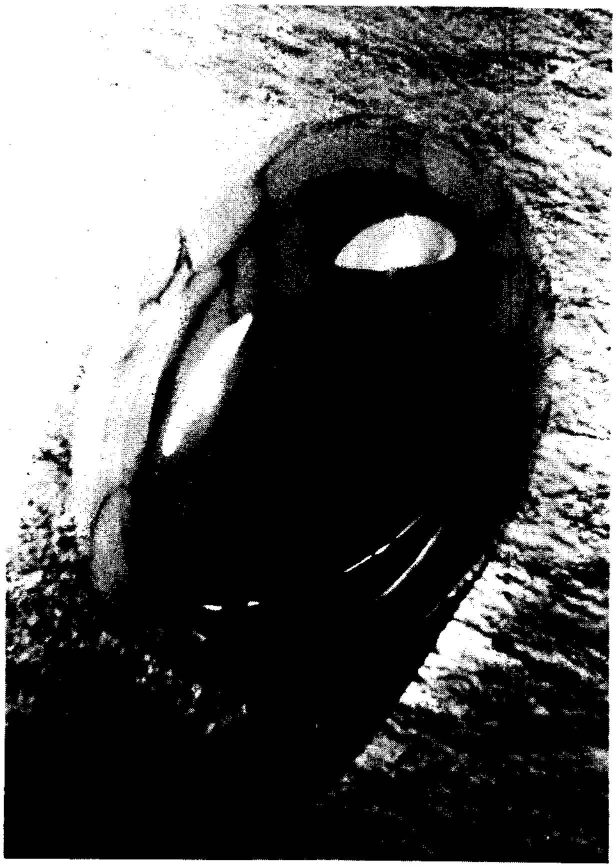


Figure 5 PERSIAN SPIDERWEB TURQUOISE

2. Same as 1, except that the stone shows an attractive spiderweb pattern across the entire surface. This quality is usually called Persian spiderweb.

3. Same as 2, except that the stone contains varying amounts and patterns of matrix. Depending on the amount, color, and location of the matrix (overall attractiveness being the principal consideration), grades vary. This type is called Persian matrix.

B. 2nd QUALITY

1. This quality is light blue and not as intensely colored as Persian. In addition these stones are more opaque than Persian turquoise. Although many approach semitranslucency, the luster is not as high and the texture is often spotted with slightly lighter or darker areas. No trace of matrix is present.

2. Same as 1, except that the stone shows a fine spiderweb pattern across the entire surface.

3. Same as 1, except that varying amounts of matrix are present.

C. 3rd QUALITY

Greenish blue to bluish green stones, even in the finest quality, rarely approach the 2nd quality stones. Poor quality matrix stones are in little demand.

D. 4th QUALITY

Stones in this category are light to dark yellowish green. Poor qualities with much matrix are of very little value.

Figure 6 PERSIAN MATRIX TURQUOISE

Note: The qualities described in the second, third, and fourth categories are frequently sold under such names as American, Egyptian, Afghanistan, etc. However, only the Persian quality is a strongly established trade grade. Actually, the tendency in the trade is to call all but the Persian quality American turquoise, even though some very fine top quality turquoise comes from American sources. Remember these terms are used in the trade as quality grades only, not as indications of actual geographical origin.

IX. BUYING AND SALES ASPECTS

Turquoise's major source of appeal is its color which is so distinctive that "turquoise" has become one of the standard shades of blue. Because it is opaque it is usually fashioned into cabochons or beads. Larger pieces make spectacular carvings. It takes an excellent polish which highlights its cool, pure color.

In the late 1960s and early to mid-70s Indian jewelry from the American Southwest suddenly became very popular. This jewelry is traditionally made of silver and set with coral, turquoise, and shell. Very rarely, you may also see it made of gold, or gold and silver together, and set with other gemstones. Some people bought Indian jewelry as an investment because they thought that this type of craftsmanship was dying and would be unavailable in the future. Soon entrepreneurs began manufacturing pseudo-Indian jewelry and all kinds of imitation turquoise. As jewelers began to see more and more of this jewelry, accounts of difficulties in repairing, *testing*, and appraising it began to appear in trade journals and be passed by word of mouth.

Although the American Indian jewelry industry has declined since its heyday in the 1960s and 70s, this jewelry is still available, particularly in the American Southwest where it has remained popular. Jewelers who come in contact with turquoise and silver Indian jewelry should be aware of the problems that may be encountered with it.

Some of the Indian crafted jewelry is beautifully made and expensive to repair or replace. Unfortunately silver conducts heat so efficiently that it is difficult to control temperatures while repairing silver jewelry and since turquoise is vulnerable to heat, stones can be damaged. Consequently many jewelers either refused to repair this type of jewelry or set the repair fee high enough to make the risk worthwhile. If you do accept turquoise jewelry for repair, always discuss the job with your customer and outline any problems your anticipate. In some instances you may want to ask the customer to sign a waiver releasing you from responsibility if the piece is damaged or cannot be repaired once the work is started. (Many job envelopes already have such a statement printed on them.) When you are repairing turquoise jewelry, it may be wise to remove the stones before working on the piece, and reset them afterward.

Many jewelers discovered when they unmounted turquoise that the stones were backed with a bonded metal material. Reports from people in the Southwest indicate that thin pieces of turquoise are laid on top of a layer of liquid metal cement and left until the material hardens. The excess backing is cut away and the individual stones are fashioned. These stones are then bezel set so that the backing is not visible.

Never put turquoise in an ultrasonic cleaner. Porous stones will absorb the solution and may be discolored by it, and the surface of both the porous and the more compact stones can be damaged if the stones are in contact with other jewelry when the ultrasonic is vibrating.

Pseudo-Indian jewelry and imitation turquoise has created problems for many jewelers. This jewelry is cheaply made and usually will not last. Jewelers who had inexperienced salespeople at their take in counter were occasionally dismayed to learn that a piece of jewelry their staff had accepted for repair had completely fallen apart before it even got to the jeweler's bench. Such jewelry is usually so poorly made that repairing it is difficult, if not impossible.

The implications are clear. Have experienced salespeople examine all turquoise jewelry (and all other jewelry) before it is accepted for repair. Be aware that inexpensive turquoise jewelry is fragile and may be poorly made — stones are frequently glued in and the metal may be so flimsy that the piece will not hold up under standard repair procedures. On the other hand, the fine quality pieces are expensive, often one of a kind, items that are virtually impossible to replace if they are damaged in your store.

Always consider carefully both the difficulties inherent in repairing this jewelry, and the fact that much turquoise is treated, before accepting turquoise jewelry for repair or appraisal.

Because most turquoise is somewhat porous, it will absorb hand lotions, skin oils, and perfumes that may alter its color especially over a long period of time. Always instruct your customers in the care and maintenance of their jewelry. Advise them to keep cosmetics away from turquoise and point out that excessive contact with skin oils may damage their stones.

For the retail jeweler, turquoise's major attraction is that it appeals to a broad consumer audience. Almost anyone can afford to own turquoise jewelry. Many jewelers have used turquoise jewelry as a way of introducing their customers to the idea of owning fine jewelry set with genuine stones. In addition, turquoise is a versatile gemstone. It can be attractively mounted in formal, traditional jewelry, or it can be worn more casually. Spiderweb and matrix patterns provide a natural contrast with turquoise's color and can create unusual one of a kind stones.

The best turquoise usually finds its way into the world jewelry market where it is set in conventional and often formal jewelry of exquisite workmanship. But most domestic turquoise is locally absorbed by Indian craftsmen and other domestic jewelry manufacturers — including those who make pseudo-Indian jewelry and those who manufacture tumbled gems from the lesser grades. Thus turquoise jewelry is available in a wide range of qualities: from beautifully made pieces containing the finest quality semitranslucent stones to inexpensive jewelry. As a result any jeweler can market turquoise profitably, regardless of his retailing style.